

REMARKS/ARGUMENTS

Claims 1, 4-6, 8-9, 11, 21, 24, 27, 30, and 33-41 are pending.

Claims 1, 8, 11, 21, 24, 27, and 30 have been amended.

Claims 2-3, 7, 10, 12-20, 22-23, 25-26, and 31-32 have been cancelled.

Claims 21, 24, and 33-36 have been withdrawn.

Support for the amendments is found in the claims and specification (e.g., pages 15-16, 17, and 21), as originally filed. No new matter is believed to have been added.

Claims 1, 4-8, 16-18, and 27-32 are rejected under 35 U.S.C. 103(c) over Susumu et al., JP 2001-240407, and Brownhill et al., US 4,289,513. The rejection is traversed because:

(1) the combination of the references does not describe or suggest:

(a) the claimed element comprising a honeycomb-shaped activated carbon paper obtained by molding a composition comprising a binder and activated carbon (i) satisfying  $b/a = 0.3$  through 0.55 and (ii) adsorbing and desorbing gasoline vapor, wherein (iii) the binder comprises pulp and at least one polyvinyl alcohol (PVA)-based binder fiber providing fire retardancy (e.g., claim 1);

(b) the claimed element, wherein the binder comprises the pulp and two polyvinyl alcohol (PVA)-based binder fibers, a ratio of the activated carbon/pulp/first PVA/second PVA is 60/20/10/10, and the second PVA-based binder fiber provides fire retardancy (claims 37-41); and

(c) the claimed element formed by molding an activated carbon obtained by paper-making (e.g., claims 8, 27, and 30);

(2) the activated carbon of the cited references does not inherently possess the claimed b/a ratio because it is produced by a different method, has a small pore diameter and is inferior in the adsorption and desorption of gasoline vapor;

(3) modifying the element of the cited references with a reasonable expectation to obtain the claimed ratio would not have been obvious because the claimed element achieves a different goal; and

(4) the claimed b/a ratio is not result-effective variable.

(1) The cited references do not describe or suggest the claimed element.

*Advantages of the claimed element.*

The present specification describes that the claimed honeycomb-shaped activated carbon paper reduces the leak amount of fuel vapor, provides a low pressure drop (increase in the pressure drop results in lengthening the fuel feeding period) and excellent moldability and strength (pages 1-2, 5-8). To achieve these characteristics, the activated carbon has to possess an excellent adsorption and desorption property (pages 2, 5-6, 7), which is achieved by using the claimed activation method providing the ratio of b/a from 0.3 to 0.55, and a honeycomb-shaped activated carbon paper. Carbon can be activated, for example, in gas atmosphere (e.g., steam, carbon dioxide, oxygen) (see page 15 and the Examples).

Further, a binder comprising pulp and PVA-based binder possessing fire retardancy is used to prevent the element from flaming caused by an exposure to a high temperature (e.g., pages 17 and 21 of the present specification).

In addition, the claimed honeycomb-shaped activated carbon paper is advantageous with respect to the resistance against shock provided by interlocking the binder fibers with the activated carbon without clogging of pores on the activated carbon surface. When a vehicle is parked, gasoline vapor generated from a gasoline tank is adsorbed by activated carbon filled in a canister. However, when a vehicle is parked for a long period of time, the

adsorbed gasoline, with the passage of time, moves from the inlet side to the outlet side of the canister and evaporates into the atmosphere by a difference in the gaseous phase concentration of gasoline vapor between the inlet side and the outlet side in the canister.

It is undesirable, in terms of environmental pollution, that gasoline evaporates into the atmosphere. In the USA, since 2004, vehicle fuel evaporation control regulations called Tier 2, and in California, called LEV II have been enforced. According to these regulations, the evaporative emission of gasoline while parking for 72 hours, that is, Diurnal Breathing Loss (DBL) is reduced to a value remarkably lower than conventionally. Furthermore, p-ZEV (Partial Zero Emission Vehicle) regulation requires a canister to satisfy an emission value of 5 through 15 mg (page 5, lines 5 to 20, of the present specification).

An object of the present invention is to provide an activated carbon paper honeycomb molding, which can reduce the leak amount of evaporated fuel such as gasoline and has low pressure drop and excellent moldability and strength, and a method for producing this, and to provide an element for a fuel evaporative emission preventing device for preventing the release of the fuel evaporative emission from a fuel tank system and an intake system by using said activated carbon paper honeycomb molding (page 8, line 20 to page 9, line 4 in the original English text).

*A conventional canister* having a filled adsorbent such as activated carbon *cannot satisfy the above strict regulations*. However, according to the present invention, such strict regulations can be complied with by using an activated carbon paper honeycomb molding defined based on the ratio of specific concentration n-butane adsorbing amounts, as an element for fuel evaporative emission preventing devices in combination with the conventional canister; and further the fuel evaporative emission from the intake system can be prevented from evaporating and a fuel evaporative emission preventing device having

suitable strength can be provided by installing the activated carbon paper honeycomb molding in the intake system.

The adsorption capacity of fuel vapors such as gasoline has been conventionally represented by Butane Working Capacity (BWC) measured based on ASTM-D5228, and generally, a higher BWC is excellent as adsorption capacity (page 11, lines 12 to 15, in the specification). Accordingly, a canister having an excellent gasoline adsorption capacity can be obtained by increasing the BWC. However, in a parked vehicle, to prevent movement by a difference in gaseous phase concentration of gasoline vapor, just increasing the activated carbon amount may pose such problems as an increase in pressure drop and longer fueling time.

The element for fuel evaporative emission preventing devices including the activated carbon paper honeycomb molding according to the present invention is a breakthrough achievement that can clear the strict regulations only by attaching the element to the conventional canister or installing the element in the intake system, and has no problem in terms of strength. That is, the present invention is characterized by the element for fuel evaporative emission preventing devices which was made by consideration of highly concentrated n-butane adsorption capacity and low concentrated n-butane adsorption capacity, the element including the activated carbon paper honeycomb molding which is applicable to the strict regulations and has no problems in terms of strength (page 11, lines 12 to 20 in the specification).

In consideration of the strict regulations regarding gasoline evaporative emission, the present invention relates to the element, which is used in combination with the conventional canister, for preventing evaporative emission of gasoline vapor into the atmosphere from a gasoline tank or intake system in line with parking of a vehicle for a long period of time, and a producing method for the same. The present invention was made by newly finding that

selection of activated carbons suitable for activated carbon paper honeycomb molding for preventing movement due to a difference in gaseous phase concentration of absorbed gasoline vapor is defined by a ratio between high n-butane concentration and low n-butane concentration. A selection of such activated carbon cannot be generally decided by conventional physical properties of activated carbon and manufacturing conditions of activated carbon, and it is required to use activated carbons which satisfy the ratio between n-butane concentrations specified in the present invention.

The activated carbon paper honeycomb molding of the present invention satisfies a specific range (b/a) when 100%-concentration n-butane adsorbing amount per 100 parts by weight of activated carbon at 40° C is defined as a parts by weight and a 1%-concentration n-butane adsorbing amount per 100 parts by weight of activated carbon at 40° C is defined as b parts by weight. The technical meaning resides in newly finding that the molding of the present invention can be distinguished from the conventional moldings according to an inclination of the straight line when 1% and 100% butane concentrations are indicated on an abscissa and the butane adsorbing amounts b and a respectively corresponding to the butane concentrations are indicated on an ordinate.

*Disclosure of the cited references.*

Susumu et al. describe an activated carbon capable of efficiently adsorbing small molecular weight materials such as hydrogen and nitrogen and a method of carbon activation (see page 1 of the automated English translation, Field of Invention). The described method provides for a uniform small pore diameter of the activated carbon for adsorbing the small molecular matter efficiently (see page 1, Problems to be Solved; and [0007]-[0008], [0012]-[0013], [0017]). The surface area of the activated carbon is 500-3000 m<sup>2</sup>/g (see [0007], [0017], Table 1) and the adsorption quantity of nitrogen is 10 ml/g or more at 25 °C and 1 atm (see [0007], [0017], Table 1).

Thus, Susumu et al. disclose activated carbon having a sharp peak in the pore distribution that is suitable for adsorption of a small molecule gas such as nitrogen but is unsuitable for adsorption and desorption of gasoline vapors due to its small micropore size.

Although Examples 15 to 18 and Comparative examples 16 to 19 of Susumu et al. describe that the butane working capacities were measured, the declaration which was previously filed by one of the inventors, Ishikawa, reveals that the activated carbon of the invention of Susumu et al. does not satisfy the specific range (b/a).

Susumu et al. describe a binder such as a powder or tar, a pitch, a phenol resin, or a grain (see [0010]).

Susumu et al. do not describe an element comprising a honeycomb-shaped activated carbon paper obtained from an activated carbon satisfying  $b/a = 0.3$  through 0.55.

Susumu et al. do not describe the specific claimed binder comprising (i) pulp and at least one polyvinyl alcohol (PVA)-based binder fiber providing fire retardancy; (ii) pulp and two polyvinyl alcohol (PVA)-based binder fibers, a ratio of the activated carbon/pulp/first PVA/second PVA is 60/20/10/10, and the second PVA-based binder fiber provides fire retardancy.

Susumu et al. do not disclose that the described activated carbon can adsorb and thereafter desorb gasoline vapor which is an important factor in preventing a fuel evaporation emission (see the present specification pages 1-9). It is impossible to adopt the Susumu activated carbon for an element for a fuel evaporation emission preventing device because it is inferior in the adsorption and desorption of gasoline vapor which is important in preventing a fuel evaporation emission.

Also, although small pores are desirable for filtering small molecules as in Susumu et al. (e.g., nitrogen gas), clogging pores having a small diameter on the activated carbon surface is a problem.

Also, the Examiner is of the opinion that the Susumu et al. activated carbon can be used for adsorption and filtration in fuel systems for automobile engines. However, the present invention does not provide such an absorbent or filter, but provides an element for a fuel evaporation emission preventing device. The claimed element is neither a filter nor merely adsorbent of small materials, but is adsorbent and desorbent of gasoline vapor.

Susumu et al. do not describe the paper-making and inserting a honeycomb-shaped activated carbon paper into a canister for producing an element for a fuel evaporation emission preventing device that prevents the gasoline vapor emission to the atmosphere for 72 hours even when a vehicle is parked (see pages 1-9 of the present specification).

Brownhill et al. describe a molding obtained by molding a mixture of an activated carbon, a binder, and a fibrous paper base material (*see* claim 1) and a product comprising sheets and fibers made from cellulose, latex binder material, and a particular activated carbon (*see* col. 7-8).

The Brownhill et al. latex binder includes polyvinyl chloride copolymers, acrylics, vinylidene chlorides, acrylonitriles, vinyl acetates, etc. (see col. 7, lines 36-40).

The activated carbon of Brownhill et al. is used for sorption and filtering in fuel systems, i.e., is merely used for trapping the fume from the fuel systems (see col. 7, lines 20-25; col. 9, line 30 to col. 10, line 68). The activated carbon and molding of Brownhill et al. have no relation to the claimed fuel evaporation emission device.

Brownhill et al. do not describe that the activated carbon can adsorb and desorb gasoline vapor when preventing the release of the fuel evaporation emission.

Brownhill et al. do not describe an element comprising a honeycomb-shaped activated carbon paper obtained from an activated carbon satisfying  $b/a = 0.3$  through 0.55.

Brownhill et al. do not describe the specific claimed binder comprising (i) pulp and at least one polyvinyl alcohol (PVA)-based binder fiber providing fire retardancy; (ii) pulp and

two polyvinyl alcohol (PVA)-based binder fibers, a ratio of the activated carbon/pulp/first PVA/second PVA is 60/20/10/10, and the second PVA-based binder fiber provides fire retardancy.

Brownhill et al. do not describe a paper-making process and inserting a honeycomb-shaped activated carbon paper into a canister for producing an element for a fuel evaporation emission preventing device than prevents the gasoline vapor emission to the atmosphere for 72 hours even when a vehicle is parked (see pages 1-9 of the present specification).

Further, as the standard, "the carbon tetrachloride activity," is used in evaluating activated carbon in Brownhill et al. (column 8, lines 33 to 35). However, the standard is used for evaluation of not adsorptivity and desorptivity but *only adsorptivity*. Although, it is disclosed in Brownhill et al., that the standard is 10 to 250%, preferably 30 to 150%, more preferably 50 to 125%, this indicates that the value of (b/a) used in the present invention tends to be more unsatisfied, and no consideration is given to the adsorptivity and desorptivity in Brownhill et al.

Thus, substituting the element of Brownhill et al. into that of Susumu et al. still does not produce the claimed element.

(2) The activated carbon of the cited references does not inherently possess the claimed b/a ratio because it is produced by a different method, has a small pore diameter and is inferior in the adsorption and disorption of gasoline vapor.

The Susumu et al. method comprises activating carbon at 600-1200 °C under an atmosphere that contains carbon dioxide and carbon monoxide for 1-50 hours (see abstract and [0008]-[0009], [0012]-[0013], [0019], Table 1, the Examples). It is usually carried out for 50 hours (see [0012]) or 3-30 hours (see [0016]). The result of using carbon monoxide, in addition to carbon dioxide, is forming an activated carbon having a *small pore diameter* so as to efficiently adsorb small molecular weight materials such as nitrogen gas.

The Susumu et al. activated carbon does not *inherently* possess the claimed b/a ratio because it is produced by a different method (i.e., with carbon monoxide), has a small pore diameter and is inferior in the adsorption and desorption of gasoline vapor.

The Brownhill et al. activated carbon does not *inherently* possess the claimed b/a ratio because “Columbia” activated carbon (i) is produced by using gas and steam (see Mantell, Adsorption, Chemical Engineering Series, 2d Ed., McGraw-Hill Book Co., New York, 1951, page 165, submitted previously), and (ii) is merely used for trapping the fume from the fuel systems (see col.7, lines 20-25; col. 9, line 30 to col. 10, line 68) and the activated carbon and molding of Brownhill et al. have no relation to the claimed fuel evaporation emission device.

The legal requirement for inherency is that the Susumu et al. and/or Brownhill et al. activated carbon product necessarily (i.e., each and every time the product is produced) has the b/a ratio of 0.3-055. In a recent decision, the Board stated that when the claimed and prior art compositions comprise similar components used in overlapping ranges, even if some of the art compositions might have the claimed properties, that possibility is not adequate to support a finding of inherency. *Ex parte Thomas*, Appeal 2007-4423 (July 23, 2008). The Examiner must provide some evidence to establish the reasonableness of the examiner’s believe that the functional limitation is inherent. *Id.*

(a) Applicants have perform further experimentations to show that the Susumu et al. activated carbon product does not necessarily possess the claimed b/a ratio. This experimentation is described in the Declaration under 37 CFR 1.132 of Kenichi Ishikawa filed on July 2, 2008.

As Susumu et al. do not describe an activation time used in the Susumu et al.’s Examples, the inventors used an experimental analogous of Examples 1, 4, 8, and 14 and

Comparative Examples 1, 3, 8, and 15 of Susumu et al. with regard to a reference to the specific area and the absorption quantity of N<sub>2</sub> described by Susumu et al.

Specifically, Applicants conducted the carbon activation at 900°C for a different time so that to achieve the carbon characteristics described in the tables on pages 7 and 8 of the English translation of Susumu et al.

The activation time used in the Applicants' Examples providing the Susumu et al.'s specific area and the absorption quantity of N<sub>2</sub> (of Susumu et al.'s Examples 1, 4, 8, and 14 and Comparative Examples 1, 3, 8, and 15) was as follows:

- Example 1 - 7 h (corresponds to the parameters of Example 1 of Susumu et al.);
  - Example 2 - 10 h (corresponds to the parameters of Example 4 of Susumu et al.);
  - Example 3 - 4 h (corresponds to the parameters of Comp. Example 1 of Susumu et al.);
  - Example 4 - 8 h (corresponds to the parameters of Comp. Example 3 of Susumu et al.);
  - Example 5 - 3 h (corresponds to the parameters of Example 8 of Susumu et al.);
  - Example 6 - 2.5 h (corresponds to the parameters of Comp. Example 8 of Susumu et al.);
  - Example 7 - 5 h (corresponds to the parameters of Example 14 of Susumu et al.);
- and
- Example 8 - 4 h (corresponds to the parameters of Comp. Example 15 of Susumu et al.).

The claimed activated carbon was activated at, for example, 900 °C for 10 or 12 hours (see Examples 1-2 of the present specification).

The results obtained are shown in Table 1 (see the attachment to this paper).

As shown in Table 1, the Susumu et al. activated carbon product does not inherently possess the claimed b/a ratio. Examples 1, 2, 5, and 7 in the Declaration show that if carbon is activated in the atmosphere of carbon dioxide and carbon monoxide, the ratio b/a is much larger than that claimed. Examples 3, 4, 6, and 8 in the Declaration show that when carbon is activated by steam or steam and carbon monoxide, the ratio b/a is smaller but is still outside of the claimed range.

(b) Applicants have conducted experiments to show that the activated carbon paper produced by paper-making according to the present invention is superior to the activated carbon produced by employing a latex type binder, as described by Brownhill et al.

In the claimed element, as a binder, binder fibers including pulp, fiber binder, and a fire retardant are used. By subjecting the binder fiber to the paper-making, the fibers are strongly entwined with the activated carbon, superior intensity is obtained and a binder effect can be exerted without clogging pores on a surface of the activated carbon, and thus the adsorption capacity of the activated carbon can be effectively used.

In Brownhill et al., the latex type binder material is used to bind the activated sorption particles to the fibrous base paper material.

In this regard, Applicants submit another Declaration by Kenichi Ishikawa (one of the inventors) with this paper.

The following experiments demonstrate that the activated carbon paper produced by paper-making according to the present invention is superior to the activated carbon produced by employing a latex type binder, as described by Brownhill et al.

Reference Example:

1 kg of a raw material obtained by crushing and sieving coconut shell charcoal into 8 through 16 meshes was put in a batch-wise rotary kiln with a capacity of 10 liters, raised in

temperature to 900°C while flowing a slight amount of nitrogen gas, and then activated by introducing carbon dioxide gas at 5 liters/min as an activation gas.

After 12 hours, the introduction of carbon dioxide gas was stopped, and the material was cooled and taken out. The benzene adsorption capacity of the activated material was measured as 57.1%. The activated carbon obtained was crushed by a ball mill to a central grain diameter of 50 micrometers.

#### Experiment 1:

The activated carbon obtained by Reference Example was mixed with pulp and the polyvinyl alcohol (PVA)- based binder KURALON VBP107-1 made by KURARAY CO., LTD., and for improvement in fire retardancy, a PVA-based binder KURALON VPX203 made by KURARAY CO., LTD. at the weight percentages of activated carbon/pulp/VPB/VPX=60/20/10/10. To 100 parts by weight of the obtained mixture, 4000 parts by weight of water was added and mixed. The obtained slurry material was paper-made into an activated carbon paper molding. The molding was molded into a corrugated shape, whereby a corrugated honeycomb molding with a cell density of 120 cpsi was obtained.

#### Experiment 2:

The Experiment 1 was performed in the same manner as Experiment 1 except that a latex was used in place of VPX.

#### Experiment 3:

The Experiment 1 was performed in the same manner as in Experiment 1 except that a latex was used as a binder and activated carbon/latex=60/40 in terms of weight percentages. To 100 parts by weight of the obtained mixture, 4000 parts by weight of water was added and mixed. But, it was impossible to obtain an activated carbon paper from this slurry material by paper-making.

#### Experiment 4:

The corrugated honeycomb molding obtained by Experiment 1 and 2 was cut into a 100mm square with a length of 10mm, horizontally attached to a container with an internal size of 100mm square and a length of 300mm so as not to create gaps on its periphery, 5 percent by volume of n-butane was flown upward at 100 milliliter/min, and the n-butane concentration on the outlet side was measured. From the adsorption time until the inlet side concentration reached 10 percent, an n-butane adsorbing amount was calculated. The results are shown in Table 1.

The activated carbon paper obtained in Experiment 2 was inferior to Experiment 1 in n-butane adsorbing amount due to presumably clogging pores on a surface of the activated carbon by a latex. The activated carbon paper obtained in Example 1 was superior to Experiment 2 in fire-retardancy.

Table 1

	n-butane adsorbing amount (g)
Experiment 1	0.135
Experiment 2	0.090

(c) In addition, this specification discloses that even if the same compounds are used for producing the molding, the resultant moldings have different properties because a method of carbon activation is particularly impotent.

Specifically, as illustrated in Table 1 on page 29, the same compounds and the same amount of the compounds is used in Example 1 and Comparative Example 5. However carbon activation time in Example 1 is 12 hours and 6 hours in Comparative Example 5. Table 1 shows that the b/a ratio in Example 1 is 0.395 and the molding is suitable for its intended use, while the b/a ratio in Comparative Example 5 is 0.614 (outside of the claimed range) and the molding is unsuitable. Likewise, carbon compounds in Example 2 and Comparative Example 6 are the same and are used in the same proportion. The activation of

carbon in Example 2 is conducted for 10 hours, while in Comparative Example 6 it is 18 hours. The results in Table 2 show that the b/a ratio in Example 2 is 0.358, while the ratio in Comparative Example 6 is 0.288 (outside of the claimed ratio). As a result, the molding of Comparative Example 6 is unsuitable in an evaporation emission preventing device.

The specification describes various fuel evaporation emission preventing devices (pages 1-9). However, they do not provide excellent reduction of the leak amount of fuel vapor, do not low the pressure drop, and do not have excellent moldability and strength (pages 8-9, bridging paragraph).

Thus, the Susumu et al. and Brownhill et al. activated carbon does not necessarily have the claimed characteristics.

(c) Susumu et al. and Brownhill et al. do not describe the paper-making and inserting a honeycomb-shaped activated carbon paper into a canister for producing an element for a fuel evaporation emission preventing device.

The specification shows that parameters of a corrugated honeycomb molding is important for the performance of the molding, as illustrated in Examples 5-7 and Comparative Example 7-8. In Comparative Example 7, the amount of 3GX activated carbon is reduced compared to Examples 5-7. As a result, the activated carbon of Comparative Example 7 is defective. Also, in Comparative Example 8, a commercially available ceramic honeycomb activated carbon formed by *extrusion* molding and bound in parallel by an adhesive does not satisfy the drop test and is defective. In contrast, the claimed molding is formed by a *paper-making* method (pages 14-15).

Thus, the Susumu et al. and Brownhill et al. element does not necessarily have the claimed properties because it is not produced by the claimed paper-making molding. Even if some of the art compositions might have the claimed properties, that possibility is not

adequate to support a finding of inherency. *Ex parte Thomas*, Appeal 2007-4423 (July 23, 2008).

Thus, a method of activation of carbon and a method of forming the carbon molding “shapes” properties of the molding and the Susumu et al. and Brownhill et al. element does not necessarily have the claimed properties.

(3) Modifying the element of the cited references with a reasonable expectation to obtain the claimed ration would not have been obvious because (i) the claimed element achieves a different goal and (ii) there are unlimited combinations of a large number of parameters that can be modified, wherein the result is unpredictable.

(a) One would not have modified the Susumu et al. and/or Brownhill et al. activated carbon product so that activated carbon adsorbs and desorbs gasoline vapor, to achieve the claimed ratio  $b/a$ , and to use a honeycomb-shaped activated carbon paper because (i) Susumu et al. concern forming an activated carbon having a small pore diameter so as to efficiently adsorb small molecular weight materials such as nitrogen gas, which is achieved by activating carbon under an atmosphere that contains carbon dioxide and carbon monoxide; and (ii) Brownhill et al. element is merely used for trapping the fume from the fuel systems, and the activated carbon and molding of Brownhill et al. have no relation to the claimed fuel evaporation emission device.

The present invention concerns reducing the leak amount of fuel vapor and providing a low pressure drop (increase in the pressure drop results in lengthening the fuel feeding period), excellent moldability and strength, and the resistance against shock provided by interlocking the binder fibers with the activated carbon without clogging of pores on the activated carbon surface.

(b) There are unlimited combinations of a large number of parameters that can be possibly modified to vary characteristics of the activated carbon-based element of the cited references to achieve a variety of goals. Therefore, one would not have reasonably expected

obtaining a reduced leak amount of fuel vapor and a low pressure drop, excellent moldability and strength, and the resistance against shock because one would have to choose from a large number of parameters and solutions which are not predictable based on the disclosure of the cited references. *KSR International Co. v. Teleflex Inc.*, 127 S.Ct 1727 (2007).

In a recent decision, the Board stated that “[t]o the extent an art is unpredictable, as the chemical arts often are, *KSR*’s focus on these “identified, predictable solutions” may present a difficult hurdle because potential solutions are less likely to be genuinely predictable.” *Eisai Co, Ltd. v. Dr. Reddy’s Lab.*, 533 F.3d. 1353 (Fed. Cir. July 21, 2008).

(c) The claimed ratio  $b/a$  provides advantageous results (see Tables 1 and 2 comparing the claimed element of the Examples and the products of the Comparative Examples, wherein when the ratio  $b/a$  is within the claimed range, the element has superior properties).

(d) Moreover, the claimed element uses an honeycomb-shaped activated carbon paper satisfying the p-ZEV regulatory requirements (*see* page 5, line 16, to page 6, line 11). According to the p-ZEV, the vehicles must meet the stringent ZEV emission requirements (*see* page 5, lines 16-20, and the attached PZEV Emission Technology sheets). To meet the ZEV requirements, the inventors found that it is necessary for the activated carbon to satisfy  $b/a = 0.3-0.55$ . To satisfy the claimed ratio, activation conditions have to be tightly controlled (*see* the Examples in the present specification). For example, if coconut shells are used as a carbonaceous material, the activated carbon obtained by a short-time steam activation shows good adsorption capacity, but does not satisfy the claimed ratio, and, therefore. Also, the activated carbon obtained by a long-time steam activation shows good desorption capacity, but does not satisfy the claimed ratio. Consequently, both activated carbons do not satisfy the ZEV requirements (*see* the Examples in the present specification).

PZEV was adopted in 1998 as part of LEV II (*see* the attached PZEV Emission Technology sheets). Brownhill et al. did not recognize the ZEV requirements because it was not adopted at the time of filing (March 27, 1978) and developing the activated carbon satisfying the ZEV stringent requirements was not necessary.

Thus, Brownhill et al. would not have been motivated to modify the element to tightly control gasoline vapor emission at even parked vehicles because the p-ZEV regulatory requirements have not been implemented at the time of the Brownhill et al. invention.

(4) The claimed b/a ratio is not result-effective variable.

For optimizing the ratio b/a, the prior art must first recognize a particular parameter as a result-effect variable, i.e., that a reduction of the leak amount of fuel vapor and a low pressure drop is a function of the ratio b/a. The cited references do not recognize this dependency.

In a recent decision, the Board stated that while the discovery of an optimum value of a variable in a normally obvious, this is not always the case. *Ex parte Thomas*, Appeal 2007-4423 (July 23, 2008). One exception to the rule is where the parameter optimized was not recognized in the prior art as one that would affect the results. *Id.* The Examiner has to point to a teaching in the cited reference or provide any explanation based on scientific reasoning, that would support the conclusion that those skilled in the art would have considered it obvious to optimize the prior art composition to the level recited in the claims. *Id.*

Thus, optimizing the b/a ratio is not routine.

Thus, for the reasons discussed above, Susumu et al. and Brownhill et al. do not make the claimed element obvious.

Applicants request that the rejection be withdrawn.

The rejection of claims 9 and 11 under 35 U.S.C. 103(a) over Susumu et al., Brownhill et al. and Kosaka et al., US, 5,118,329, is unsustainable because the combination

of the references does not describe or suggest an element comprising two canisters connected consecutively, wherein one canister comprises the claimed honeycomb-shaped activated carbon paper and another canister comprises granular activated carbon.

The disclosure of Susumu et al. and Brownhill et al. is discussed above. Kosaka et al. do not cure the deficiency.

Kosaka et al. disclose a chemically activated shaped carbon. Kosaka et al. disclose in FIG. 2 a solvent recovery process with two activated carbon layers arranged in parallel. However, the two activated layers of Kosaka et al. include the same activated carbon. Thus, the canisters are arranged to switch properly for a continuous operation.

Although Kosaka et al. disclose a two canister system illustrated at Fig. 1, Kosaka et al. do not disclose that a first canister comprises granular activated carbon and a second canister comprises the claimed honeycomb-shaped activated carbon paper, wherein the canisters connected consecutively.

The claimed canister arrangement satisfies the required ZEV emission values even when a vehicle is parked (page 5-6 of the specification). The Kasaka et al. canisters are connected in parallel, do not comprise different activated carbon, and perform well for the intended purpose, i.e., to recover of hydrophobic organic compounds (col. 2, lines 19-23).

PZEV was adopted in 1998 as part of LEV II (*see* the attached PZEV Emission Technology sheets). Kosaka et al. did not recognize the ZEV requirements because it was not adopted at the time of filing (May 14, 1991) and developing the activated carbon satisfying the ZEV stringent requirements was not necessary.

One would not have been motivated to use the canisters connected sequentially and a first canister comprising granular activated carbon and a second canister comprising the claimed honeycomb-shaped activated carbon paper based on the disclosure of the cited references because a goal of Kosaka et al. is merely recovering a solvent by using two

activated carbon layers in parallel, while the claimed canister prevents the gasoline vapors from emitting to the atmosphere for 72 hours.

In addition, the combination of the cited references does not describe the claimed element inserted in the second canister. Thus, Susumu et al., Brownhill et al. and Kosaka et al. do not make the claimed element obvious.

Applicants request that the rejection be withdrawn.

Claim 30 is objected. Applicants previously amended claim 30 and believe that claim 30 is proper.

A Notice of Allowance for all pending claims is requested.


Respectfully submitted,

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